

AMENDMENTS TO THE CLAIMS

Claims 1-8 (Canceled)

9. (Currently Amended) An optical head device for use with an optical recording medium having multiple data layers, said optical head device comprising:

a light source operable to output light;

focusing means for focusing light outputted from the light source onto a desired data layer of ~~an~~ the optical recording medium having multiple data layers;

a wavefront converting means converter provided between the light source and the focusing means;

driving means for driving the wavefront converter;

aberration detecting means for detecting an aberration amount of a spot of the ~~focus~~ light focused on the desired data layer and sending a driving amount to the driving means for driving the wavefront converter to reduce the detected aberration amount; and

~~output controlling means for controlling the light source so as to control the output of light by the light source, wherein~~

the driving means performing the driving of the wavefront converting means is driven converter according to the driving amount sent by the aberration detecting means in such a manner as to reduce the aberration amount detected by the aberration detecting ~~means, and means; and~~

~~the output controlling means stores for storing learned data indicating a relation correlation between a driving amounts of the wavefront converter and outputs of light amount to be inputted to the wavefront converting means and the output of the light source, and controls controlling the light source so as to control set the output of light outputted by the light source to an output of light indicated in the learned data as correlating to the driving amount sent by the aberration detecting means based on the driving amount to be inputted to the wavefront converting means and the learned data, the driving amount being changed depending on the aberration of the focus light spot.~~

10. (Canceled).

11. (Currently Amended) The optical head device according to Claim 9, wherein the output controlling means controls the light source so as to control the output of light output by the light source based on the product of a direct current component and an alternate current component of the driving amount to be inputted to the wavefront ~~converting means~~ converter.

12. (Currently Amended) The optical head device according to Claim 9, wherein the wavefront ~~converting means~~ converter is a liquid crystal device.

13. (Currently Amended) The optical head device according to Claim 9, wherein the wavefront ~~converting means~~ converter includes a plurality of lenses, and the driving means comprises lens driving means for driving one of the plurality of lenses to change a distance between the one lens and the other one of the plurality of lenses, ~~and the lens driving means is driven~~ in such a manner as to reduce the aberration amount detected by the aberration detecting means.

14. (Currently Amended) The optical head device according to Claim 9, wherein the output controlling means controls the light source so as to control the output of light outputted by the light source based on the driving amount and the learned data so as to compensate for a spherical aberration of the order higher than a highest order of aberration compensatable by the wavefront ~~converting means~~ converter.

15. (Previously Presented) An optical recording device comprising:
the optical head device of Claim 9; and
rotation driving means for rotating the optical recording medium.

16. (Currently Amended) An optical recording method for recording information on an optical recording medium having multiple data layers with use of a focus light spot emitted from a light source, the method comprising:

storing in advance learned data indicating correlation between outputs of light of the light source and driving amounts by which a wavefront converter is to be operated to reduce an aberration;

~~learning in advance a relation between a driving amount by which wavefront converting means is to be operated so as to reduce an aberration of the focus light spot, and an output of the light source;~~

detecting the aberration amount of the focus light spot;

sending a driving amount to the wavefront converter for driving the wavefront converter to reduce the detected aberration amount;

driving the wavefront ~~converting means~~ converter according to the sent driving amount so as to reduce the aberration; and

setting the output of light outputted by the light source to an output of light indicated in the learned data as correlating to the driving amount sent in said sending ~~controlling the light source so as to control the output of light outputted by the light source based on the driving amount of the wavefront converting means.~~

17. (Currently Amended) An optical head device for use with an optical recording medium having multiple data layers, said optical head comprising:

a light source operable to output light;

a focusing system operable to focus light outputted from the light source onto a desired data layer of ~~an~~ the optical recording medium having multiple data layers;

a wavefront converter provided between the light source and the focusing system;

a wavefront converter driver;

an aberration detector operable to detect an aberration amount of a spot of the ~~focus~~ light focused on the desired data layer and to send a driving amount to the wavefront converter driver for driving the wavefront converter to reduce the detected aberration amount; and

~~an output controller operable to control the light source so as to control the output of light outputted by the light source, wherein~~

~~the wavefront converter driver being operable to drive the wavefront converter is driven according to the driving amount sent by the aberration detector in such a manner as to reduce the aberration amount detected by the aberration detector; and~~

~~the an output controller is operable to store learned data indicating a relation correlation between a driving amounts of the wavefront converter and outputs of light amount to be inputted to the wavefront converter and the output of the light source, and to control the light source so as to control set the output of light outputted by the light source to an output of light indicated in the learned data as correlating to the driving amount sent by the aberration detector based on the driving amount to be inputted to the wavefront converter and the learned data, the driving amount being changed depending on the aberration of the focus light spot.~~

18. (Previously Presented) The optical head device according to Claim 17, further comprising a driving amount detector operable to detect the driving amount to be inputted to the wavefront converter, wherein the output controller is operable to control the light source so as to control the output of light outputted by the light source based on the driving amount detected by the driving amount detector.

19. (Previously Presented) The optical head device according to Claim 17, wherein the output controller is operable to control the light source so as to control the output of light outputted by the light source based on the product of a direct current component and an alternate current component of the driving amount to be inputted to the wavefront converter.

20. (Previously Presented) The optical head device according to Claim 17, wherein the wavefront converter is a liquid crystal device.

21. (Currently Amended) The optical head device according to Claim 17, wherein the wavefront converter includes a plurality of lenses, and the wavefront converter driver includes a lens driver operable to drive one of the plurality of lenses to change a distance between the one lens and another one of the plurality of lenses, ~~and the lens driver is driven~~ in such a manner as to reduce the aberration amount detected by the aberration detector.
22. (Previously Presented) The optical head device according to Claim 17, wherein the output controller is operable to control the light source so as to control the output of light outputted by the light source based on the driving amount and the learned data so as to compensate for a spherical aberration of the order higher than a highest order of aberration compensatable by the wavefront converter.
23. (Previously Presented) An optical recording device comprising:
the optical head device of Claim 17; and
a rotation driver operable to rotate the optical recording medium.
24. (Canceled).
25. (Previously Presented) The optical head device according to claim 9, wherein the output controlling means comprises a computer.
26. (Previously Presented) The optical head device according to claim 9, wherein the aberration detecting means comprises a computer.
27. (Canceled).
28. (Currently Amended) The optical head device according to claim ~~27~~17, wherein the wavefront converter driver comprises a voice coil motor.

29. (Previously Presented) The optical head device according to claim 17, wherein the output controller comprises a computer.

30. (Previously Presented) The optical head device according to claim 17, wherein the aberration detector comprises a computer.

31. (New) An optical head device for use with an optical recording medium having multiple data layers, said optical head device comprising:

a light source operable to output light;

focusing means for focusing light outputted from the light source onto a desired data layer of an optical recording medium having multiple data layers;

a wavefront converter provided between the light source and the focusing means;

driving means for driving the wavefront converter;

aberration detecting means for detecting an aberration amount of a spot of the light focused on the desired data layer and sending a driving amount to the driving means for driving the wavefront converter to reduce the detected aberration amount;

the driving means performing the driving of the wavefront converter according to the driving amount sent by the aberration detecting means in such a manner as to reduce the aberration amount detected by the aberration detecting means;

driving amount detecting means for detecting an amount of the driving of the wavefront converter performed by the driving means; and

output controlling means for storing learned data indicating correlation between amounts of driving of the wavefront converter and outputs of light of the light source, and controlling the light source so as to set the output of light outputted by the light source to an output of light indicated in the learned data as correlating to the amount of driving detected by the driving amount detecting means.

32. (New) An optical head device for use with an optical recording medium having multiple data layers, said optical head comprising:

- a light source operable to output light;

- a focusing system operable to focus light outputted from the light source onto a desired data layer of ~~an~~ the optical recording medium having multiple data layers;

- a wavefront converter provided between the light source and the focusing system;

- a wavefront converter driver;

- an aberration detector operable to detect an aberration amount of a spot of the light focused on the desired data layer and to send a driving amount to the wavefront converter driver for driving the wavefront converter to reduce the detected aberration amount;

- the wavefront converter driver being operable to drive the wavefront converter according to the driving amount sent by the aberration detector in such a manner as to reduce the aberration amount detected by the aberration detector;

- a driving amount detector operable to detect an amount of the driving of the wavefront converter performed by the wavefront converter driver; and

- an output controller operable to store learned data indicating correlation between driving amounts of the wavefront converter and outputs of light of the light source, and to control the light source so as to set the output of light outputted by the light source to an output of light indicated in the learned data as correlating to the amount of driving detected by the driving amount detector.